



# Future Combat Systems



12-00

## (Characteristics of) Critical Technologies for FCS

**Dr. James N. Walbert**  
**Chief, Technical Division**  
**PM-FCS**

Report Documentation Page		
<b>Report Date</b> 18062001	<b>Report Type</b> N/A	<b>Dates Covered (from... to)</b> - -
<b>Title and Subtitle</b> (Characteristics of) Critical Technologies for FCS		<b>Contract Number</b>
		<b>Grant Number</b>
		<b>Program Element Number</b>
<b>Author(s)</b> Walbert, James N.		<b>Project Number</b>
		<b>Task Number</b>
		<b>Work Unit Number</b>
<b>Performing Organization Name(s) and Address(es)</b> PM-FCS		<b>Performing Organization Report Number</b>
<b>Sponsoring/Monitoring Agency Name(s) and Address(es)</b> NDIA (National Defense Industrial Association 2111 Wilson Blvd., Ste. 400 Arlington, VA 22201-3061		<b>Sponsor/Monitor's Acronym(s)</b>
		<b>Sponsor/Monitor's Report Number(s)</b>
<b>Distribution/Availability Statement</b> Approved for public release, distribution unlimited		
<b>Supplementary Notes</b> Proceedings from Armaments for the Army Transformation Conference, 18-20 June 2001 sponsored by NDIA.		
<b>Abstract</b>		
<b>Subject Terms</b>		
<b>Report Classification</b> unclassified		<b>Classification of this page</b> unclassified
<b>Classification of Abstract</b> unclassified		<b>Limitation of Abstract</b> UU
<b>Number of Pages</b> 14		



# CSA Statement of the Problem



12-00



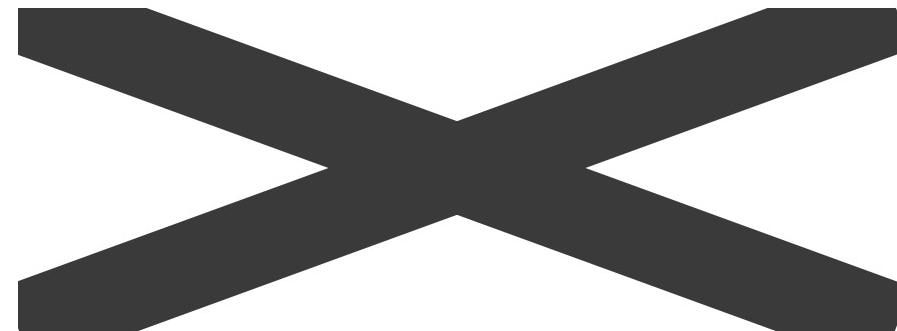
**“We must provide early entry forces that can operate jointly, without access to fixed forward bases, but we still need the power to slug it out and win decisively. Today, our heavy forces are too heavy and our light forces lack staying power. We will address those mismatches.” --  
GEN Shinseki, CSA, 23 June 1999**



# The Army Transformation



12-00



*. . . Responsive, Deployable, Agile, Versatile,  
Lethal, Survivable, Sustainable.*



# FCS is an Integrated System of Systems



12-00

## Firepower

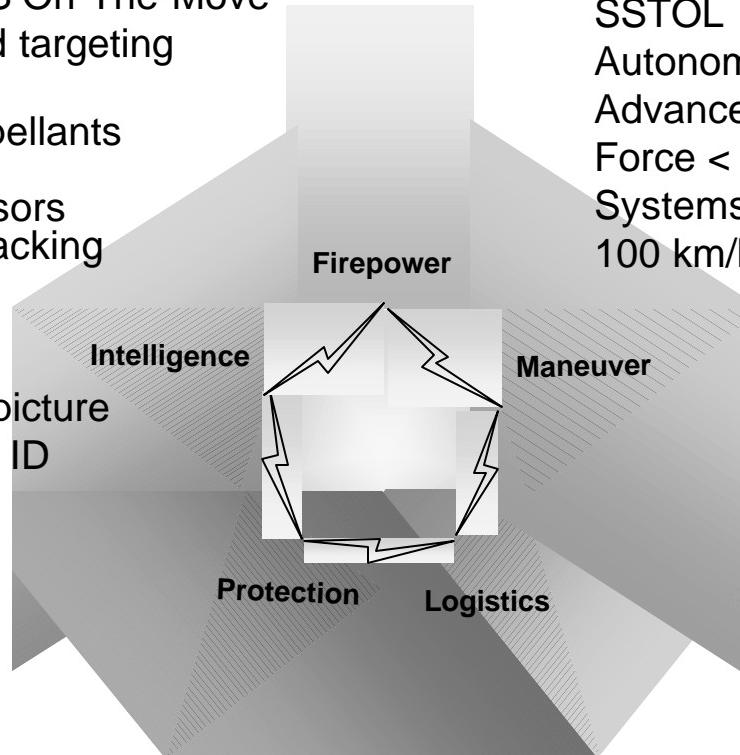
- Extended engagements BLOS On-The-Move
- All weather precision fires and targeting
- One Shot, One Kill, > 15 Km  
Advanced Cannons/Propellants  
Netted Fires  
Foliage Penetration Sensors  
Continuous Precision Tracking

## Maneuver

- Gain positional advantage, bring fires to bear  
SSTOL  
Autonomous Robotics  
Advanced Propulsion Systems  
Force < 6000 tons  
Systems < 20 tons  
100 km/hr + air movement

## Intelligence

- Common relevant operating picture  
Automatic Classification ID  
Long Range Sensors  
Netted Sensors



## Protection

- Profoundly better SA
- Extended engagement and agile maneuver  
Low Observables  
APS  
Robotics

## Logistics

- Reduced footprint and tail
- Condition based maint
- Prognostic/ diagnostic
- Ultra Reliability
- Fuel Efficient
- High PK munitions
- Robotics
- Telemedicine/ maintenance

## SA based Real-Time 4D

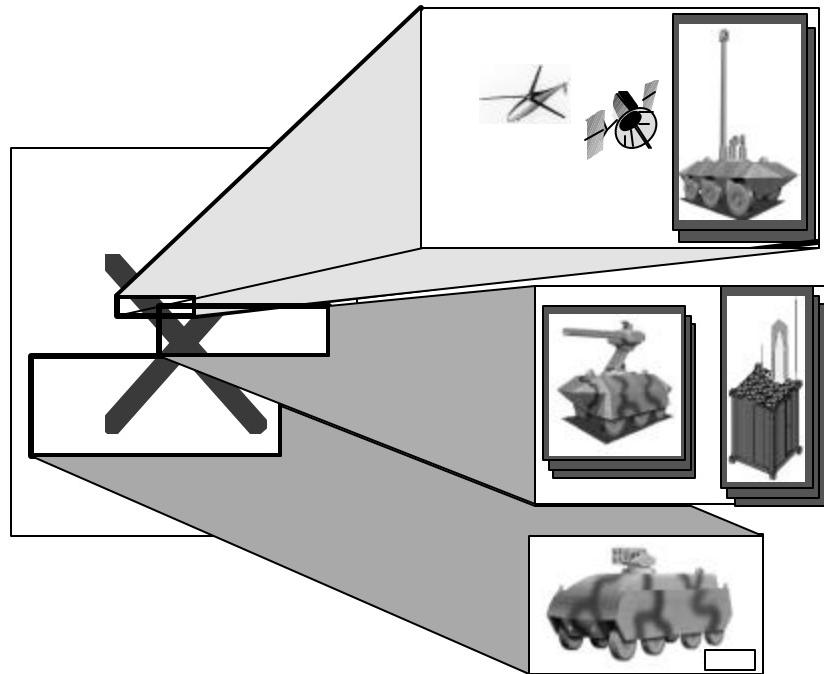
Dynamic Battlespace Deconfliction



# Technical Approach



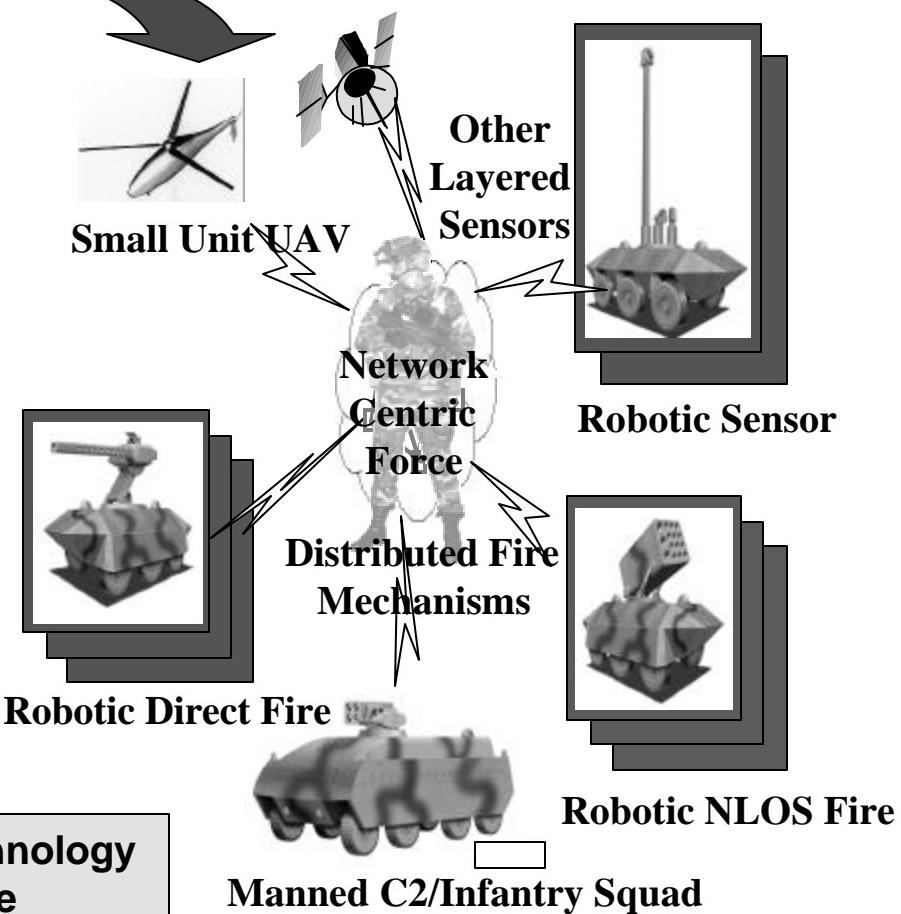
12-00



**From This...**

**Network Centric Distributed Platforms**

**To This...**



**Exploit Battlefield Non-Linearities using Technology  
to Reduce the Size of Platforms and the Force**



# What is FCS?



12-00

**Would you recognize FCS if you saw it?**

**FCS is more like a Carrier Group, or a Bomber Group, than anything the Army has ever had.**

**FCS is a network centric, collaborative fighting entity.**

**FCS is 3-dimensional; FCS is designed to fight at Extended Ranges.**



# Technology Axioms

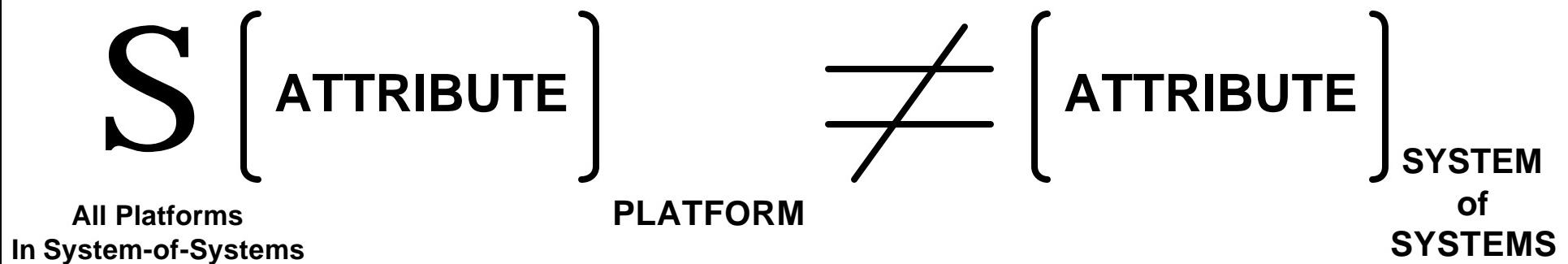


12-00

- There are ***NO OBVIOUS*** technologies for FCS.
  - Many (technologies) are called, but few are chosen.
- 3) Any technology not chosen for FCS ***could still be useful*** for the Objective Force.
- 4) The goal ***IS NOT*** to be the biggest, strongest thing on the battlefield. Rather, it ***IS*** to be the smartest, fastest, ***WINNINGEST*** thing on the battlefield.
- 5) Technologies in the absence of Tactics, Techniques, and Procedures (TTPs) are certainly ***interesting***, but not necessarily ***useful*** to FCS.



# Walbert's Law





# Theorems, Counterexamples, etc.



12-00

## FCS is all about paradigm shifts

### 1) When is stealth not stealth?

Do I choose PM Squirrel, or PM Canada Goose?

The Stealth Bomber

### 2) Network Centric Warfare is less about the Network, than about Networking.

### 3) Getting your technology on FCS is like getting it on an aircraft

Stringent weight/space requirements.

Your technology is *OFF* the system until proven necessary.

### 4) There is *NO* room for weight growth.



# Self-Scoring System



12-00

## How does your technology stack up?

### If your technology:

- is labeled “for FCS”	0 points
- can be made “non-platform-centric”	2 points
- can work “on-the-move”	2 points
- will be at “TRL 6 by 2006”	2 points
- works at “extended ranges”	2 points
- is “smaller than a breadbox, and weighs less than a feather”	2 points * non-tradable

### Bonus points awarded for

- Remote control capability	2 points
- Robotic-enabled capability	2 points

**10 points or more is a good score!!**



# Okay, so what technologies ARE important?



- 1) Infostructure**
- 2) Networking Architecture**
- 3) Software**
  - 3.5) Decision Aids**
- 4) Sensors**
- 5) Precision guided/smart munitions**
- 6) Materials**
- 7) The rest of the stuff**



# Technical Challenges



- Designing a robust, *survivable* networking architecture.
- Designing a robust software architecture.
- Systems Integration (hardware, software, network).
- Human/Machine Interface.
  - Tactical use/trust of robots
  - Situational Understanding
  - Span of control of robots
- Designing FCS for seamless technology transition.
  - Platform/component weight ceilings are fixed
  - Block modifications/Engineering changes will be *different*
- Demonstrating to the soldiers that FCS works.



# Conclusions



We **CAN** achieve the CSA's vision for FCS,  
and for the Objective Force.

Achieving that vision means transforming  
the **ENTIRE** Army, including **YOUR** part.

The largest single barrier is **NOT** technical,  
it is mental: there is no “standard method”  
for FCS; there are no *a priori* accepted  
principles except the laws of physics.



12-00

**James N. Walbert, Ph.D.  
Chief, Technical Division, PM-FCS  
Chairman, Technical IPT**

**PM-FCS/NVESD  
ATTN: PM-FCS  
10221 Burbeck Road, Suite 340  
Ft. Belvoir, VA 22060-5806  
[jim.walbert@belvoir.army.mil](mailto:jim.walbert@belvoir.army.mil)**

**703-704-3121  
FAX 703-704-2981  
Cell 703-362-8964**